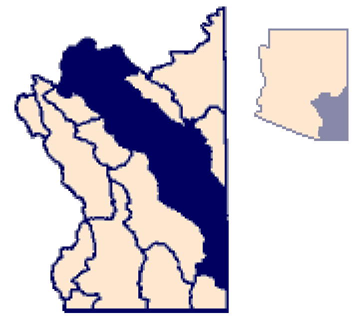
SAFFORD BASIN



The Safford basin is located in southeastern Arizona and covers approximately 4,854 square miles in both the Basin and Range and Central Highlands physiographic provinces (Figure 17). The basin is divided into the San Simon Valley, Gila Valley and San Carlos Valley sub-basins. The basin generally forms an elongated valley bounded by the Chiricahua, Dos Cabezas, Pinaleno and Santa Teresa Mountains to the southwest, and the Peloncillo and Gila Mountains to the northeast. Elevations in the basin vary from 10,713 feet above mean sea level at Mount Graham, to 3,000-4,000 feet above mean sea level on the inner mountain valley floors, to about 2,400 feet above mean sea level at San Carlos Lake. The southern part of the basin slopes gently to the northwest and is drained by the Gila and San Simon Rivers. The northern portion of the basin includes much of the San Carlos Indian Reservation which is drained to the south by the San Carlos River.

The Safford basin is a large trough-like depression formed by elongated mountain ranges which rim a broad alluvial-filled valley. The mountains are composed of gneiss, schist, granite, volcanics, and sedimentary rocks. The valleys are filled with erosional remnants of these mountains. The major aquifer in each of the three sub-basins is found in the alluvial fill; however, differing physical and chemical characteristics exist in each.

SAN SIMON VALLEY SUB-BASIN

White (1963) divided the alluvial fill into two major units: the younger and older alluvium. The younger alluvium consists of the most recent stream deposits found along the major stream courses. The older alluvium represents the majority of the basin-fill material and is composed of interfingering beds and lenses of clay, silt, sand and gravel. The older alluvium, as described by White, also contains a dense clay deposit (referred to as the Blue Clay unit) which may reach up to 600 feet thick. This unit marks the top of the older alluvium and separates the upper and lower aquifers. Groundwater, in general, is found under water-table conditions in the upper aquifer and under artesian conditions in the lower aquifer.

Prior to development, groundwater movement generally followed surface-water patterns. Since the early 1950's, when pumpage increased dramatically, groundwater movement has been toward areas of intense pumpage near farming centers. Declines in water levels are greatest in these areas. Barnes (1991) found maximum declines in the lower aquifer of up to 211 feet near Bowie from 1962-1987, and declines of up to 100 feet common around much of the sub-basin. In the southern part of the sub-basin, groundwater level changes ranged from a rise of 15 feet to a decline of 15 feet over the same period.

Water levels as reported by Barnes (1991) in the upper aquifer for 1987 ranged from 30 to 150 feet below land surface, and discharge from wells varied from 75 to 300 gallons per minute. In the lower aquifer, water levels range from less than 100 to 500 feet below land surface and large irrigation wells yield 500 to 2,000 gallons per minute. Water quality is variable across the sub-basin but generally, the upper aquifer contains high total dissolved solids and fluoride (Barnes, 1991).

GILA VALLEY SUB-BASIN

Halpenny and Cushman (1947) divided the basin-fill into two units, consisting of the younger and older alluvium. The younger alluvium consists of clay and unconsolidated silt, sand, and clay occurring in discontinuous lenses. The thick blue clay layer generally marks the bottom of the unit. The older alluvium consists of weakly-consolidated layers of clay, silt, evaporates and conglomerate. The principal aquifer in the Gila Valley is the younger alluvium found along the inner and tributary valleys; however, groundwater occurs in both the younger and older alluvium.

Water levels in the sub-basin mainly are controlled by recharge from the Gila River. There has been little change in water levels since groundwater first was developed. Most recharge comes from the Gila River; smaller amounts are contributed by mountain-front recharge and seepage of irrigation water. Freethey and Anderson (1986) estimated that, prior to development, as much as 16,000 acre-feet per year entered the sub-basin as groundwater underflow from the Bonita Creek and Duncan Valley basins.

Groundwater in the younger alluvium is found under water-table conditions. Average discharge from wells is 1,000 gallons per minute, but discharges of 2,500 gallons per minute have been reported (Black, 1991). The older alluvium generally is found under artesian conditions and well discharges may reach 660 gallons per minute. Groundwater in the younger alluvium generally is high in total dissolved solids which partially may be attributed to infiltration of irrigation water. Groundwater in the older alluvium also is high in dissolved solids because of the existence of evaporite deposits. The Safford area has significant nitrate contamination of the groundwater (Arizona Department of Environmental Quality, 1990).

SAN CARLOS VALLEY SUB-BASIN

As reported by Brown (1989), most groundwater development in the San Carlos sub-basin is along the Gila and San Carlos Rivers where the younger stream alluvium makes up the main water-bearing unit. Stream alluvium consists of mainly unconsolidated sand and gravel and may be up to 100-feet thick. Basin-fill consists of sand, silt, limestone, clay, and volcanics up to 3,200 feet thick. Wells tapping the stream alluvium and the upper part of the basin-fill may yield 900 gallons per minute or more. In the northern part of the sub-basin groundwater development is limited to a few stock wells which yield less than 50 gallons per minute from volcanic rocks.

Several public-supply wells are operated by the City of Globe in the western portion of the sub-basin about one mile west of the San Carlos Indian Reservation. The U.S. Geological Survey (1989) reported a water-level decline of 170 feet between 1974 and 1987 in one well located in Section 9, Township 1 South, Range 16 East.

Areas of greatest development along the Gila and San Carlos Rivers have, in some cases, seen a rise in water levels in response to large surface water flows (Brown, 1989). Water quality generally is good and suitable for most purposes; however, stream alluvium along the Gila River contains large concentrations of total dissolved solids and arsenic levels above the Federal drinking water standards in localized areas (Brown, 1989).